2-WIRE DUPLEX (2WDX) CHANNEL UNIT, 628290

GENERAL DESCRIPTION

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1. GENERAL

1.01 This Section provides a general description of the ITT D448 2-wire duplex (2WDX) channel unit, 628290 (Fig. 1), to the functional block diagram level.

1.02 Whenever this Section is reissued, the reasons for reissue will be listed in this paragraph.

1.03 The unit provides a voice frequency (VF) and signaling interface between another duplex unit (solid state or relay type) and the D448 multiplex terminal common equipment. In the transmit direction, the unit converts VF and signaling information into pulse code modulation (PCM) for application to the common equipment. In the receive direction, the unit decodes received PCM into VF and signaling information. During system outages, the unit provides various disconnect/make-busy routines for the trunk. The unit provides a 150-, 600-, or 1200-ohm, 2-wire, 2-way duplex message circuit.

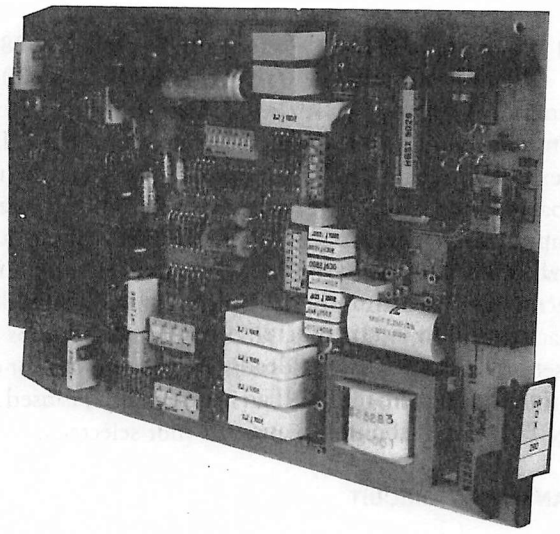


Fig. 1—2WDX Channel Unit, 628290

2. DESCRIPTION

2.01 The unit mounts in the D448 multiplex shelf (channel unit mounting section) in connectors J1A through J24A (for Digroup A) or connectors J1B through J24B (for Digroup B). Installation procedures for the unit are provided in Section ITTR-18-441.

2.02 The unit is available in Group -0 only.

2.03 The unit consists of an epoxy-glass printed circuit board (PCB) and associated circuit components. The lower front edge of the PCB is fitted with a handle to facilitate insertion and removal of the unit from the shelf. An identification strip on the handle face indicates the unit mnemonic (2WDX), last three digits of the model number, last three digits of the part number, and issue letter. The part number and issue letter are also located on the component side of the PCB.

2.04 The E LED (DS1), the BSY switch (S7), and the splitting card jack (J1) are located on the front edge of the PCB.

2.05 Printed circuit wiring is etched on both sides of the PCB. The unit inputs and outputs are terminated

in gold-plated contacts on the rear edge of the PCB. These contacts mate with a 60-pin contact edge connector on the rear of the multiplex shelf.

3. FUNCTIONAL OPERATION (FIG. 2)

HYBRID

3.01 The hybrid is toll-grade and provides 28-dB (minimum) echo return loss and a 20-dB (minimum) singing return loss. Either the internal compromise network (by selecting DIP switch option [CN]) or an external precision balance network (PBN) may be used to balance the hybrid. Regardless of whether the internal compromise network or an external PBN is used, additional build-out capacitance may be paralleled across it by selecting DIP switch options [2] through [64]. Build-out capacitance from 0.002 to 0.126 uF in 0.002-uF steps may be selected. The NT and NR leads are brought out for connection to an external PBN. If an external PBN is used, the [CN] DIP switch should be opened (not selected).

TRANSMIT VF CIRCUIT

3.02 The incoming VF is transformer-coupled, via part of the transmit (TX) level DIP switch, to the low-pass/high-pass filter where it is amplified and filtered. The gain applied to the input signal can be varied over a 15-dB range to compensate for VF input levels from +6.0 to −9.0 dBm (in 1-dB steps) by the selection of TX level DIP switch options [+1], [+2], [+4], and [+8]. In the 2WDX, the resulting signal is fed to the TX office wiring loss (OWL) compensation circuit. The TX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to compensate for wiring/cabling losses. The range for input levels is +6.0 to −10.5 dBm in 0.1-dB steps. The resulting signal is applied to the encoder.

3.03 The encoder converts the VF signal and signaling information (Para. 3.07) to an 8-bit PCM word. When the TX AND gate is activated by the transmit logic unit (TLU) on the TCS4-X and TCS6-X leads, the 8-bit word is applied to the TLU via the TCD bus. The data is clocked out of the unit under control of the 1.536-MHz clock from the TLU.

RECEIVE VF CIRCUIT

3.04 An 8-bit PCM word from the receive logic unit (RLU) is applied to the decoder on the RCD bus. The decoder will only accept the data when the receive (RX) AND gate is activated by the RLU on the RCS4-X and RCS6-X leads. The decoder converts the PCM word into a VF signal and signaling information (Para. 3.09).

3.05 The VF signal is applied to the low-pass filter and passed through to the RX OWL compensation circuit. The RX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to the signal out of the low-pass filter to compensate for office wiring/cabling losses. The output of this circuit is further amplified. This amplification can be varied over a 15-dB range (in 1-dB increments) by the selection of RX VF level DIP switch options [−1], [−2], [−4], and [−8]. This provides output levels of +6.0 to −9.0 dBm in 0.1-dB increments with the OWL options. The amplified VF is transformer-coupled to the C.O. equipment. The transformer and DIP switch options are identical to those described in Para. 3.02.

SIGNALING

A. General

3.06 Slide switch options [NOR]/[REV] allow signaling leads to be reversed. To compensate for various loop lengths from 0 to 5,000 ohms, DIP switch options [250], [500], [1K], [2K], and [3K] are provided for resistive matching in 250-ohm steps. DIP switch options [A] and [B] provide 4 to 6 uF capacitive balance in 0.1-uF steps to compensate for loop capacitance of 0 to 2 uF between transmit and receive pairs.

B. Transmit Signaling

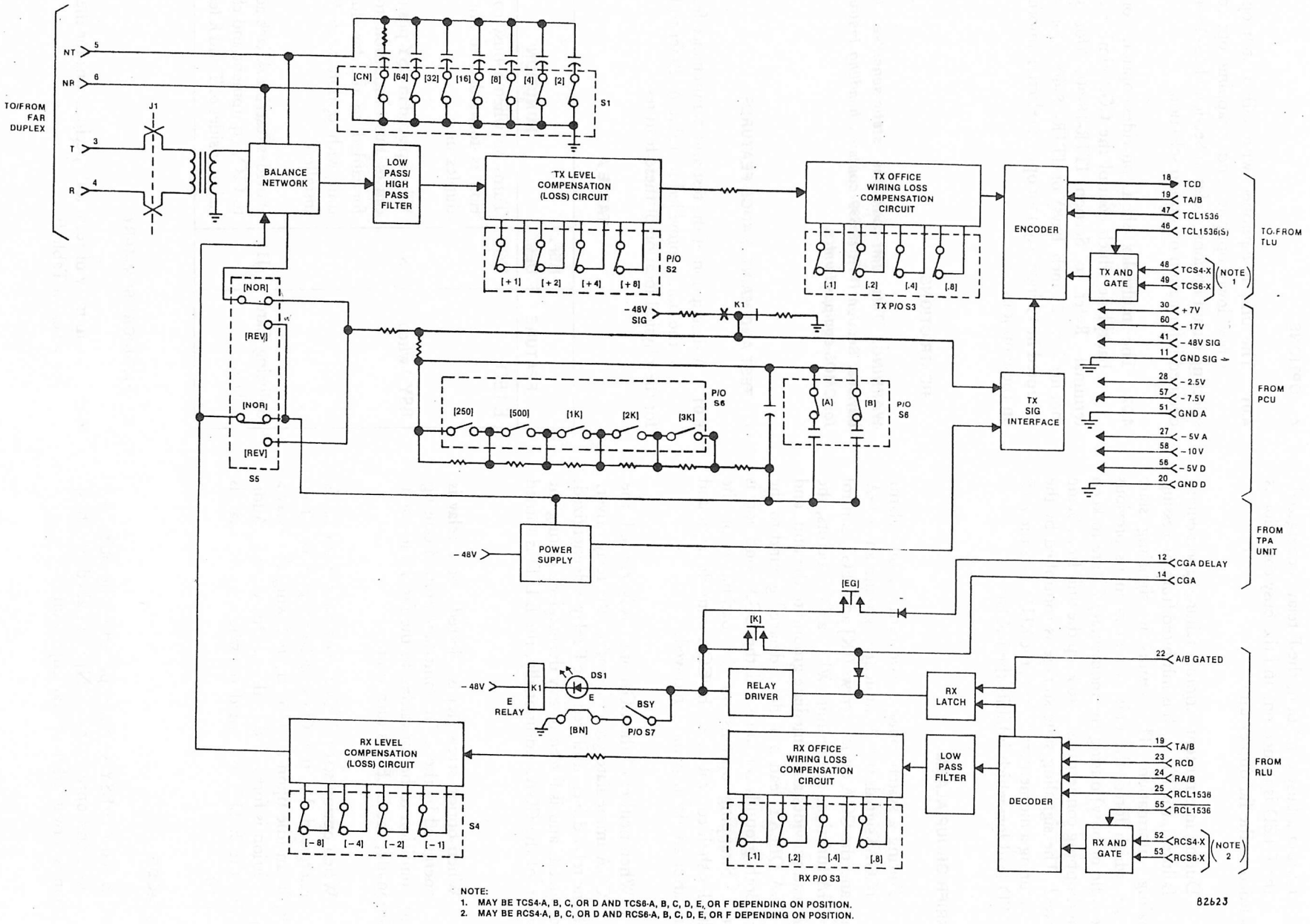
3.07 When the far duplex unit is idle, this condition is received and applied to the TX signaling (SIG) interface circuit, which in turn applies this information to the encoder. However, the encoder will not process the information until it is signaled on the TA/B lead by the TLU that the signaling frame is upcoming.

3.08 When the far duplex unit is busy, the condition is applied to the TX SIG interface circuit and processed as described in Para. 3.07.

C. Receive Signaling

3.09 The decoder converts receive signaling information from the 8-bit PCM word when it is signaled by the RLU on the RA/B lead that the signaling frame is being processed by the terminal. The decoded signaling information is applied to the RX latch.

3.10 During an idle condition, the E relay is deenergized, the E LED is off, and the idle condition is forwarded to the far duplex unit.



NOTE:
1. MAY BE TCS4-A, B, C, OR D AND TCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.
2. MAY BE RCS4-A, B, C, OR D AND RCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.

Fig. 2—2WDX Channel Unit, 628290, Functional Block Diagram

3.11 During a busy condition, the E relay is energized, the E LED is turned on, and the busy condition is forwarded to the far duplex unit.

3.12 During intermittent terminal failures (momentary failures), the RX latch is inhibited from processing signaling information. This results in signaling state storage, which forces the unit to remain in its previous state (idle or busy) during the momentary failure to keep from dropping connections or to keep the unit from being accessed. The signaling state storage is controlled by the RLU. During a momentary failure, the RLU forces the A/B GATED lead low which inhibits the RX latch.

CARRIER GROUP ALARM

3.13 During a system outage, two carrier group alarm (CGA) signals (CGA immediate ground and CGA delay) and the CGA option screws ([K] and [EG]) control the CGA functions of the unit. When a CGA occurs, the CGA lead provides an immediate ground to the unit, and the CGA DELAY lead provides a delayed ground to the unit. Both grounds remain until the CGA condition is cleared. Strapping options on the backplane of the multiplex shelf control when the CGA immediate ground occurs after an alarm signal is received.

3.14 When neither of the CGA options is selected, the CGA immediate ground inhibits the relay driver. With the relay driver inhibited, the E relay is deenergized, if energized, and is forced to stay deenergized during the duration of the CGA. Additionally, the E LED is turned off.

3.15 When option screw [K] is selected, the E relay is energized by the CGA immediate ground causing a busy condition to be forwarded to the far duplex unit. Additionally, the E LED is turned on.

3.16 When option screw [EG] is selected, the E relay is energized by the CGA delayed ground. This results in an idle upon a CGA and following the delay a busy condition is forwarded to the far duplex unit. Additionally, the E LED is turned on when the E relay is energized.

BUSY MODE

3.17 When the BSY switch is placed in the BSY position, and option strap [BN] is installed, the busy condition is forwarded to the far duplex unit.

4. OPTIONS

4.01 The unit is equipped with DIP switch options, screw-down options, and strapping options for selecting circuit options. Refer to Section ITTR-18-441 for detailed information on option selection.

4.02 The multiplex shelf provides options on the backplane which control the CGA timing of the terminal. Refer to Section ITTR-18-405 (for shelves mounted in 23-inch bays) or ITTR-18-406 (for shelves mounted in 19-inch bays) for option selection information on these options.

5. RESTRICTIONS

WARNING: This unit contains static-sensitive (CMOS) devices. Section ITTR-18-599 contains handling instructions for CMOS-equipped units.

6. TEST AND MAINTENANCE FEATURES

6.01 A description of the test and maintenance features of the unit is provided in Table A. Refer to Fig. 1 for the physical location of these features.

TABLE A

FEATURE	REF. DES.	FUNCTION
E LED	DS1	Turns on when a busy condition is forwarded to the far duplex unit.
BSY Switch	S7	When placed in BSY position, causes busy condition to be forwarded to the far duplex unit with option strap [BN] installed.
Splitting Card Jack	J1	Provides test/break jack access to C.O. equipment and channel unit sides of T and R leads.

7. TECHNICAL SUMMARY

7.01 A summary of technical specifications for the unit is given in Table B.

TABLE B

ITEM	SPECIFICATION
DC POWER	
Voltage	**Current Drain (nominal)**
GND D, A (+5 ±0.2V)	19.5 mA
−5V	29.0 mA (idle); 36.0 mA (busy)
−10V	2.0 mA (at 5V)
+7V	7.0 mA (at 12V)
−17V	8.0 mA (idle); 12.0 mA (busy)
−48V SIG Battery	0 mA (idle); 10.0 mA (busy)
VF PERFORMANCE	
Impedance	900 ohms +2.16 uF
Levels	
Transmit	−10.5 to +6.0 dBm, adjustable in 0.1-dB steps
Receive	−9.0 to +6.0 dBm, adjustable in 0.1-dB steps
Loss Stability (End-to-End)†	±0.5 dB over life in 95% of the circuits
Tracking (End-to-End)	
−37 to +3 dBm0 Input	0.5 dB maximum deviation
−50 to −37 dBm0 Input	1.0 dB maximum deviation
Idle Channel Noise (End-to-End)	23 dBrnc0 maximum
Signal-to-Distortion	
0 to −30 dBm0 Input	33 dB minimum overall; 35 dB minimum receive or transmit
−40 dBm0 Input	27 dB minimum overall; 29 dB minimum receive or transmit
−45 dBm0 Input	22 dB minimum overall; 25 dB minimum receive or transmit
Single Frequency Distortion (at 0 dBm0)	
Input Swept from 0 to 12 kHz	−28 dBm0 maximum at any other frequency

TABLE B (CONT)

ITEM	SPECIFICATION
Input between 1004 and 1020 Hz	−40 dBm0 or less at any other frequency of 0 to 4 kHz with a distortion contribution objective from either transmit or receive of typically 6 dB better
Transhybrid Loss	
200 to 500 Hz	20 dB
500 to 1000 Hz	30 dB
1000 to 2500 Hz	35 dB
2500 to 3400 Hz	30 dB
Echo Return Loss (Measured against nominal impedance with 25 ohms in series with channel unit and no far-end channel unit)	28 dB minimum
Singing Return Loss	20 dB minimum
Frequency Response (Referenced to 1020 Hz, End-to-End)†	
200 Hz	0, −3.0 dB
300 to 3000 Hz	±0.3 dB
3200 Hz	+0.15, −1.5 dB
3400 Hz	0, −3.0 dB
Longitudinal Balance (AT&T Method)	
200 Hz	66 dB minimum
1000 Hz	60 dB minimum
3000 Hz	58 dB minimum
Longitudinal Balance (IEEE Method)	
200 Hz	60 dB minimum
1000 Hz	60 dB minimum
3000 Hz	60 dB minimum
†600-ohm setting	
SIGNALING	
Dial Pulse Distortion	4% at 10 pps, 60% break, with 5,000 ohms DX loop resistance maximum
OPERATING ENVIRONMENT	
Temperature	0 to +55°C
Humidity	To 95% at 40°C (no condensation)
Altitude	To 14,000 ft (4,300 m)

TABLE B (CONT)

ITEM	SPECIFICATION
DIMENSIONS	
Width Height Depth	0.8 in. (1.9 cm) 5.9 in. (15.0 cm) 9.7 in. (24.6 cm)
WEIGHT	1.1 lb (0.5 kg)

8. REPLACEABLE PARTS

8.01 This unit has no field-replaceable parts.

9. REFERENCES

9.01 The engineering drawings noted in Table C were used in the preparation of this Section.

TABLE C

TYPE	DRAWING NO.
Assembly	628290-000
Schematic	628290-002

9.02 Related information on the unit may be found in the ITTR Sections referenced in Table D.

TABLE D

TITLE	SECTION NO.
Connectorized Multiplex Shelf (MS/WC7, MS/WC5, MS/C7 and MS/C6), 628001, 628005, 628011 and 628015 (For 23-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-405
Connectorized Multiplex Shelf (MS19/WC7, MS19/WC5, MS19/C7 and MS19/C6), 628003, 628008, 628013 and 628018 (For 19-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-406
Special Service Channel Units — Option Selection and Installation	ITTR-18-441